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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/714,325	11/15/2000	Sung-Bae Park	SAM-169	4343

7590 11/05/2003
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EXAMINER

GOLE, AMOL V

ART UNIT	PAPER NUMBER
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2183

DATE MAILED: 11/05/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/714,325

Applicant(s)

PARK, SUNG-BAE

Examiner

Amol V. Gole

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/15/2000 and 12/15/2000.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 November 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Receipt is acknowledged of the following papers:

1. Certified copy of priority documents.
2. IDS and copies of references cited therewith.
3. Revocation of Power of Attorney.
4. Change of address form.

These papers have been placed of record in the file.

1. Claims 1-4 have been examined.

Drawings

2. Figures 1, 2A, 2B, and 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated.
3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. A figure articulating the first step of the method disclosed in claim 1, where a routine composed of unrepeatd instructions is to be executed is requested.
4. Also, proper labeling of all the drawings is requested for clear understanding of the figures with respect to the specifications and claims. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office

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action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

5. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: METHOD OF AN ADDRESS TRACE CACHE STORING LOOP CONTROL INFORMATION TO CONSERVE TRACE CACHE AREA.

6. The abstract of the disclosure is objected to because irrelevant information "K:\Samsung\169\169patapp2.wpd" is present after the abstract. Correction is required. See MPEP § 608.01(b).

7. In the Brief Description of Drawings section, figures 1, 2A, 2B and 3 should be addressed to as prior art.

8. The phrase "access times" (pg. 4, lines 15-16, lines 18-19; pg. 6, lines 10-11, lines 15-16) causes confusion as it is incorrectly used in the specification to indicate iterations of a loop. Instead, it is requested to use "current iteration count" and "total number of iterations" in place of "current access times" and "total access times" respectively. Similar changes are required in reference to the corresponding loop counters disclosed.

9. The word "access" (pg. 6, line 17) should be replaced with "execution" to better fit the description of the invention.

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10. The word "And" (pg. 3, line 28) should be replace with "Also".
11. The word "continuously" (pg. 3, line 29) should be replaced by "contiguously" to better fit the description of the invention.
12. The field of the invention is stated to be "a method of branch prediction". This leads to confusion as the specification describes a method of storing data in an address trace cache. A suggested field of invention is "a method of storing data in an address trace cache in the environment of branch prediction".

Appropriate correction is required.

Claim Objections

13. Claim 1 is objected to because of the following informalities:

1. On line 1 the claim refers to "a branch prediction method using a trace cache" while the body of the claim does not describe a branch prediction method rather a trace cache storing data. A suggested preamble is "a method of storing data in an address trace cache in the environment of branch prediction".

2. On line 2 the words "instruction is" should be replaced with "instructions are".

3. On line 6 and 7 the words "current access times" and "total access times" are requested to be replaced by "current iteration count" and "total number of iterations" respectively as they better fit the description of the invention.

Claim Rejections - 35 USC § 112

14. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

15. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

16. Claim 4 recites the limitations "the loop counter" on line 1 and "the latest updated loop count value" on line 2. There is insufficient antecedent basis for these limitations in the claim.

For purposes of the following art rejection, "the loop counter" of claim 4 is being interpreted as the loop counter for counting the total access times (total number of iterations) and "the latest updated loop count value" is being interpreted as the loop counter for counting the current access times (iteration count).

17. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

18. Claim 4 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

The claim 4 contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 4 claims a branch prediction method using a trace cache in which the loop counter is recomposed if branch prediction is missed, wherein the loop counter utilizes the latest updated loop count value. The specification also discloses the step of recomposing the loop counter with the latest updated loop count value when branch prediction is missed (pg. 6, lines 24-26) without providing more details. Nowhere in the specification is it mentioned where the branch prediction is occurring, which loop counter of the two to recompose, how to recompose it, and where to obtain the latest updated loop count. The state of the prior art does not shed light on this matter also. Without undue experimentation, one of ordinary skill in the art would not be enabled to make and/or use the invention from the disclosures of the instant application coupled with information known in the art.

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claims 1,2, and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rotenberg et al ("Trace Cache: A Low Latency Approach to High Bandwidth

Instruction Fetching", Proc. of the 29th International Symposium on Microarchitecture, Dec. 1996) in view Kiuchi et al. (US005579493A).

21. In regard to Claim 1:

22. Rotenberg et al. disclose a branch prediction method (pg. 24, col. 2, under heading "branch throughput") using a trace cache (Fig. 2) comprising the steps of:

1. if a routine (dynamic instruction stream, Fig. 2) composed of unrepeated instructions (a dynamic instruction stream is composed of routines with unrepeated and/or repeated instructions in the order of execution) is to be executed, storing an instruction of the dynamic instruction stream in the trace cache according to an order of executed instructions (Fig. 2 and pg. 25, col. 1, 2nd para. under section 1.1).

2. if a routine composed of repeated instructions is to be executed, storing all the repeated instructions of the dynamic instruction stream according to the order of execution (Fig. 2).

23. The difference between Rotenberg et al. and the 1st step of claim 1 is that Rotenberg et al. stores instructions in the trace cache while applicant claims storing the addresses corresponding to each instruction in the place of instructions themselves in the trace cache. The difference between Rotenberg et al. and the 2nd step of claim 1 is that the applicant claims, if a routine of repeated instructions is to be executed, storing a routine start address, a routine end address, current access times of the routine, total access times of the routine instead of all the instructions of the routine.

24. Kiuchi et al. teach a repeat control circuit for handling the execution of loops (Fig. 2), which stores

1. The start address of the repeating instruction routine (element 214b),
2. The total number of repeat steps in the routine (element 200), and
3. The total number of times the loop is to be executed (element 207).

When the total number of repeat steps in the routine are executed, the repeat count register (207) value is decremented (col. 7, line 37) by a down counter (208) and when its value becomes "1", the repeated execution of the specified instruction module is ended (col. 10, lines 20-28). Although the start address (214b) and the total number of repeat steps (200) in the routine can be used to indicate the end of a routine (end of one iteration), to one of ordinary skill in the art at the time of the invention would have recognized that storing the end address of the routine can also be used to indicate the end of the routine. Furthermore, it would be extremely obvious for one of ordinary skill in the art at the time of the invention to indicate that all the iterations of the specified routine are finished by storing and comparing the current number of iterations of the routine with the total number of iterations (207) instead of decrementing the total number of iterations.

25. One of ordinary skill in the art would have recognized at the time the invention was made to store addresses corresponding to the instructions in place of the instructions themselves in the trace cache to save cache area, as address bit lengths are smaller than instruction bit lengths and as they can also be used to track the execution of a program. In addition, one of ordinary skill in the art at the time the invention was made would have further been able to recognize from Kiuchi et al., to use a repeat control circuit in conjunction with the trace cache disclosed by Rotenberg et al.,

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instead of storing all the repeat instructions to handle the execution of a routine with repeated instructions (a loop) in order to reduce the number of instructions stored in the trace cache and thus save trace cache area.

26. Hence, it would have been obvious to one of ordinary skill in the art at the time of the applicant's invention, to modify the trace cache disclosed by Rotenberg et al. by storing addresses corresponding to the instructions in the trace cache and to store the start address, end address, current access times, and total access times of the routine with repeated instructions as taught by Kiuchi et al., in order to reduce the size of the trace cache.

27. In regard to Claim 2:

28. Rotenberg et al. fail to teach the loop counters for counting the current and total access times if a routine of repeated instructions is carried out. Kiuchi et al. teach the use of loop counters (Fig. 2, elements 205 and 208). It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to use loop counters in order to count the current number of iterations and total number of iterations of a routine with repeated instructions and hence reducing the size of the trace cache.

29. In regard to Claim 3:

30. Rotenberg et al. teach to address a start address (Fig. 4, fall-thru and target address), which will be subsequent to the routine (trace) when a trace ends. It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to address a start address, which will be subsequent to the routine, when the values of the loop counters are identical to each other indicating the end of the routine.

Conclusion

31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is reminded that in amending in reply to a rejection of claims in an application or patent under reexamination, the applicant or patent owner must clearly point out the patentable novelty, which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. The applicant or patent owner must also show how the amendments avoid such references or objections. See 37 CFR § 1.111.

a. Ganapathy et al. US Patent 6598155B1 has taught that the last loop instruction address is interchangeable with the total number of instructions while handling a loop (col. 14, line 50).

32. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amol V. Gole whose telephone number is 703-305-8888. The examiner can normally be reached on 8:30-5:00.

33. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on 703-305-9712. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

34. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

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October 27, 2003



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